Bulletin Penelitian Kesehatan
(Health Studies in Indonesia)

Vol. XII No. 1
1984

A PRELIMINARY STUDY OF MALAYAN FILARIASIS IN PUDING VILLAGE, JAMBI PROVINCE (SUMATERA), INDONESIA

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ABSTRACT

Beberapa daerah di Propinsi Jambi akan dikembangkan menjadi daerah transmigrasi, satu di antaranya adalah daerah Kumpeh yang terletak berdekatan dengan daerah endemik filariasis malayi. Desa yang paling dekat dengan lokasi transmigrasi tersebut adalah desa Puding.

Penelitian pendahuluan tentang penyakit filariasis telah dikerjakan di desa Puding untuk mengetahui tingkat endemisitas, periodisitas B. malayi, fauna nyamuk, jenis nyamuk yang potensial menjadi vektor filariasis, hospes reservoir dan keadaan sosial-ekonomi-budaya penduduk setempat.

Mf rate pada penduduk desa Puding adalah 18,7% dan dari B. malayi jenis subperiodik nokturna. Nyamuk yang tertangkap terdiri dari enam genera yaitu genus Anopheles, Aedes, Culex, Coquilletidia, Mansonia dan Tripteroides. Dari enam genera tersebut yang potensial untuk menjadi vektor filariasis adalah genus Mansonia dan ini didukung dengan diketemukannya larva stadium L_3 (infektif) Brugia sp di tubuh nyamuk tersebut. Keadaan sosial-ekonomi-budaya, khususnya menyangkut adat istiadat dan kebiasaan penduduk setempat, telah dipelajari.

INTRODUCTION

According to information obtained from the Director of Provincial Health Services, Jambi Province, malayan filariasis is quite prevalent in the rural areas. The parasite strain involved was not known, and *Mansonia* mosquitoes were generally incriminated as vectors in the transmission of the disease. A multidisciplinary longitudinal study has been started in an area that is being developed for settlement of transmigrants. One of the villages surrounding the transmigration area is the village of Puding. The work has been started in this village to determine the parasite strains, Mf rate and density of the vector mosquitoes and their bionomics, and the socio-economic status of the villagers.

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MATERIALS AND METHODS

Study Area

Puding village situated 40 km east of Jambi was surveyed (Fig. 1). It has a population of 364 (177 males and 187 females) people in 77 households. About 28.9 % of the population are children under the age of 10 years. The sex ratio of males and females is 1 : 1.05. The village is cut off from the transmigration area by a river (Kumpeh river) about 10 meters wide, which is the main source of water supply to the people. The village is surrounded by wasteland, swamp, scrub and secondary forest. Small scale plantings of rice, cassava, bananas, coffee and palm trees *(Arenga pinata)* for extracting brown sugar exist. Within the village, coconut trees, orchard plants and small patches of secondary forest and old rubber trees are common. The village has 26 goats, 52 cows, 2 buffaloes, 42 cats, and chickens. Dogs are rare, wild animals like leaf monkeys *(Presbytis cristata)* are common, and

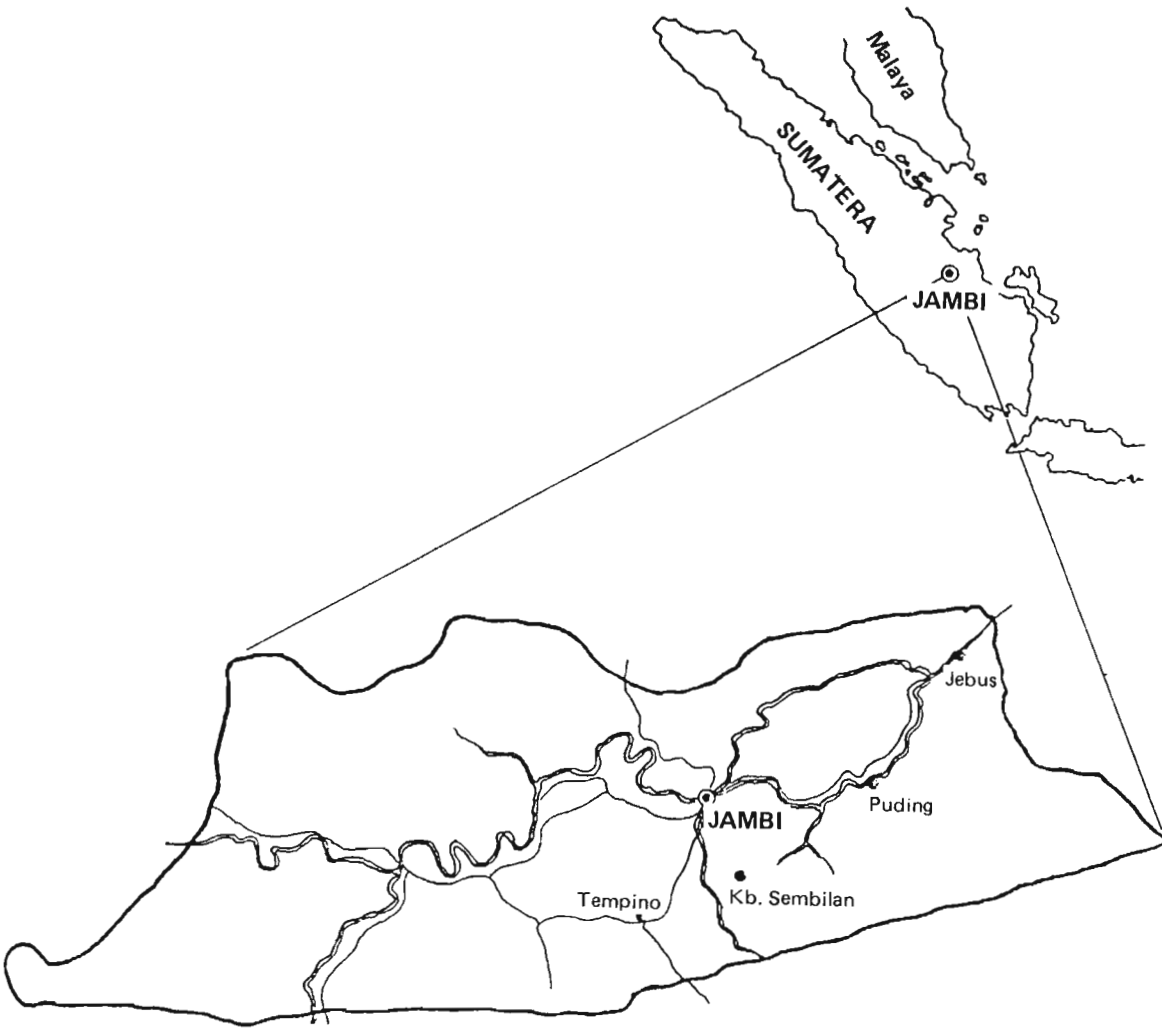

Fig. 1. Study area at Puding village.

some small troups of them rest in tall trees near the village. The common macaques *(Macaca fascicularis)* are present in the forests, but they seldom intrude the village.

Beyond the river, about 500 meters away, a large patch of forest has been felled for a transmigration scheme. The scheme is still in its development stage, and it is envisaged that transmigrants from Java will be migrated to the area beginning from 1984.

Entomological Survey

Six local mosquito collectors were employed to collect landing mosquitoes (3 each for indoor and outdoor collections) from 1800 to 2200 hours four times a month from November 1982 to January 1983, making a total of 232 man-hours per month for each indoor and outdoor collection. The procedure of processing mosquitoes obtained was in accordance with that applied by Sudomo et al. (1982).

Parasitological Survey

Blood survey were carried out on 61.8 % of the population, using 40 Cu mm thick peripheral blood smears taken between 19.00 to 24.00

hours. Blood smears were dehaemoglobinized the following morning, and then stained with Giemsa. The periodicity of the parasite was studied on 3 microfilaraemic patients using 40 Cu mm thick blood smears taken at 2 hourly intervals over a period of 24 hours.

Blood samples were taken from 35.7 % of 42 cats in the village.

Survey on the socio-economic status of the villagers was carried out by two social science anthropologists, who obtained feed-back information of the villagers through questionnaires.

RESULTS

Entomological Surveys

During the three months period, a total of 15 840 mosquitoes landing indoors and outdoors were collected, which comprised 23 species identified, and of which the mean numbers of mosquitoes per man-hours collection are shown in Table 1. There were more mosquitoes for each of the species collected outdoors than indoors. Of 15 840 landing mosquitoes collected, 6.7 % were *Mansonia* spp, 0.6 % *Anopheles* spp. and 92.7 % belonged to five other genera (*Culex* spp., *Aedes* spp., *Coquilletidia* sp., *Tripteroides* sp. and *Armigeres* sp.); *Culex* spp. alone constituted 89.3 % of the total catch. Among the five *Mansonia* spp. the lowest density was observed in *Ma. annulata*, while the density of each of the other four species was approximately equally high. The density of *Anopheles* spp. was exceptionally low, and among the five species examined, *An. nigerrimus* appeared to be predominant.

Table 1. Landing mosquitoes collected per man hours from indoors and outdoors at Puding village, Jambi, Sumatera, Indonesia.

Mosquito species	indoor	outdoor
Mansonia uniformis	0.6	1.9
Mansonia indiana	0.6	1.6
Mansonia annulata	0.2	0.6
Mansonia dives	1.7	1.8
Mansonia bonneae	0.5	8.3
Anopheles subpictus	0.01	0
Anopheles nigerrimus	0.3	0.5
Anopheles peditaenuatus	0.04	0.07
Anopheles baezai	0.01	0.05
Anopheles barbirostris	0.02	0.1
Coquilletidia nigrosignata	0.1	0.02
Culex gelidus	31.5	86.3
Culex vishnui	1.2	3.2
Culex pseudovishnui	0.1	0.5
Culex bitaeniorhynchus	0.2	0.8
Culex tritaeniorhynchus	7.2	33.7
Aedes albopictus	0.02	0.1
Aedes poecilius	0.4	0.3
Aedes lineatopennis	0.3	0.8
Aedes vexan	0.1	0.3
Aedes spp.	0.5	1.3
Tripteroides spp	1.1	1.4
Armigeres sp.	0	0.01
Total	4182	11.658

Four *Mansonia* spp. and *An. nigerrimus* were infected with filarial larvae (Table 2). There

Table 2. Filarial infections in mosquitoes in Puding village, Jambi, Sumatera

Mosquito species	OUTDOORS				INDOORS			
	1	2	3	4	1	2	3	4
Mansonia uniformis	52	3.8	3.5	1.5	158	1.9	4	1.3
Mansonia indiana	49	4.0	5.0	1.5	131	0.76	3*	–
Mansonia dives	142	–	–	–	151	0.66	3*	–
Mansonia bonneae	53	1.9	4*	1*	259	1.5	53	2.3
Anopheles nigerrimus	22	–	–	–	39	2.5	4*	1*

1 = Number mosquitoes examined.
2 = % positive with *Brugia* infection.
3 = Mean number of all stages of *Brugia* larvae per infected mosquito.
4 = Mean number of infective stage *Brugia* larvae per infected mosquito.
* = Single mosquito infected.

were more outdoor mosquitoes infected than indoor ones. The mean numbers of all stages and infective of *Brugia* larvae were found higher in *Ma. uniformis, Ma. indiana* and *Ma. bonneae,* than in *Ma. dives.* One *An. nigerrimus* from outdoor collection was infected with *Brugia* larvae.

Parasitological Survey

In the village 61.8 % of the inhabitants (98 males and 127 females) were examined. The microfilarial rate for males was 26.5 % compared to 12.6 % in females, and 18.7 % in both sexes. All the microfilariae were identified as *B. malayi* (Table 3). Higher microfilarial rates were observed in the adult population, and more so among older people of the age-group above 55 years. The youngest male infected was a six-year old child with 2 mf, and the oldest male and female were 70 and 75 years old with 47 and 5 Mf per 40 Cu mm blood. The MfD_{50} for the whole population was 4.20 per 40 Cu mm blood. Seven elephantiasis cases, afflicting 4 females and 3 males, were found in the village.

Table 3. Microfilarial rates by age-group in Puding village, Jambi Province, Northeast Sumatera, Indonesia.

Age-group (years)	Male		Female	
	Number examined	Number positive	Number examined	Number positive
0 – 5	7	0	6	0
6 – 9	13	1	8	0
10 – 14	15	2	18	1
15 – 19	3	0	21	3
20 – 24	10	5	8	0
25 – 29	11	4	12	1
30 – 34	6	2	11	1
35 – 39	11	2	4	0
40 – 44	4	2	13	3
45 – 49	2	0	2	0
50 – 54	10	6	16	3
55 – 59	2	1	2	1
60	4	1	6	3
	98	26	127	16

Following Aikat and Das's modified statistical method (1976), the results of 3 microfilaraemic patients are presented in table 4. The F^2_9 value in each of these patients was greater than 4.26, which determined that the relationship between the microfilaria count and hour is of the harmonic wave type. The test of significance for amplitude between them showed an F^3_{18} value of 1.84, which was below the critical significance level of 3.16. The combined results of the 3 patients together showed the F^2_9 was 7.8, while the periodicity index (D) was 37.95 % and the peak hour (K) was 0038 hr. As such, they are of the nocturnally subperiodic type (Fig. 2). The microfilariae in the blood sample were mostly sheathed (1.9 % exsheathment).

Filariasis in Animals

Thirty-six percent of 42 cats *(Felis cattus)* in the village were examined; 33.3 % of 15 cats examined had microfilariae infection with *Brugia* sp. Morphological studies of these Mf show they resemble to *B. malayi;* however, experimental infection will be carried out to confirm the species.

Socio-economic Survey

The survey revealed that the population in this village is a rural community with close interaction among the people. The community is homogeneous and the religion is moslem. The community characteristic is traditional selective, and individual relationship is face to face grouping. It is a farming community, all working members work in the fields from 7 to 12 noon, have afternoon break in the village for prayer and go back to the fields from 2–5 pm. The majority of the villagers bathe in the river at about 5.30 pm, and have their meals after that. They rest late in the night, and more than 80 % of them sleep with mosquito nets in their houses.

The education status of the community is relatively low, 86.8 % of the people have passed elementary school. The mobility of the population is high as they move around among adjacent villages for social contact. Their essencial income is mainly from home-made brown

Table 4. Analysis of microfilarial periodicity from Puding village, Jambi Province, Northeast Sumatera

Hour	Patient 1		Patient 2		Patient 3		Combined 3 patients	
	MFC (y)	YOB	MFC (y)	YOB	MFC (y)	YOB	MFC (y)	YOB
8	26	137.42	12	69.88	27	109.44	65	107.58
10	27	142.71	4	23.29	27	109.44	58	95.99
12	8	42.28	2	11.64	10	36.14	20	33.10
14	14	21.14	15	87.36	4	16.21	23	38.06
16	14	73.99	16	93.18	21	85.12	51	84.40
18	19	100.42	28	163.07	18	72.96	65	107.58
20	25	132.13	22	128.13	44	178.35	91	150.61
22	17	89.85	22	128.13	28	113.49	67	110.89
24	19	100.42	29	168.89	23	93.23	71	117.51
2	12	63.42	16	93.18	31	125.65	55	91.02
4	36	190.27	21	122.30	35	141.18	92	152.26
6	20	105.70	19	110.65	18	72.96	67	110.89
	(227)		(206)		(296)			
	m =	18.92		17.17		24.67		60.42
	a =	10.16		8.35		4.67		20.29
	K =	3.76		22.30		1.36		0.63
	D =	31.55		48.63		38.07		33.58
	F_9^2 =	10.16		11.06		4.64		7.77
	N =	12		12		12		12
	Y^2 =	51 57		42.96		85 58		491 33
	b =	3.27		7.52		8.79		20.0
	c =	4.99		−3.64		−3.32		3.42

MFC = Microfilarial counts in 40 ul blood.

YOB = Percentage against mean Mf count in 24 hours.

sugar and from tapping of rubber in plantations. 81.8 % of the population welcome the new transmigration project across the river, which when completed could increase their income through trading.

The health status of the population was rather fair. During the survey, there was no indication of the prevalence of nutritional deficiency, although there were some anaemic cases among the children. There were also no skin diseases, nor complains of malaria in the village.

DISCUSSION

In previous studies of malayan filariasis, periodic *B. malayi* was found in Southwest and North Bengkulu (Lie et al., 1960; Suzuki et al., 1981; Sudomo et al., 1982). Mashat (1960) examined 14 hospital patients. We have re-examined Mashat's data using the method of Aikat and Das (1976). All were periodic except one which showed a non-periodic pattern. In Medan, North Sumatera (umpublished record) one of 5 Mf carriers showed a subperiodic pattern, the rest were periodic. The present study of malayan filariasis in Puding, Jambi Province, Sumatera, has found 3 Mf carriers exhibited a subperiodic pattern.

The exsheatments of microfilariae in these patients were 1.9 %, which resemble the subperiodic pattern of the Malaysia form (Sivanandam & Dondera, 1972).

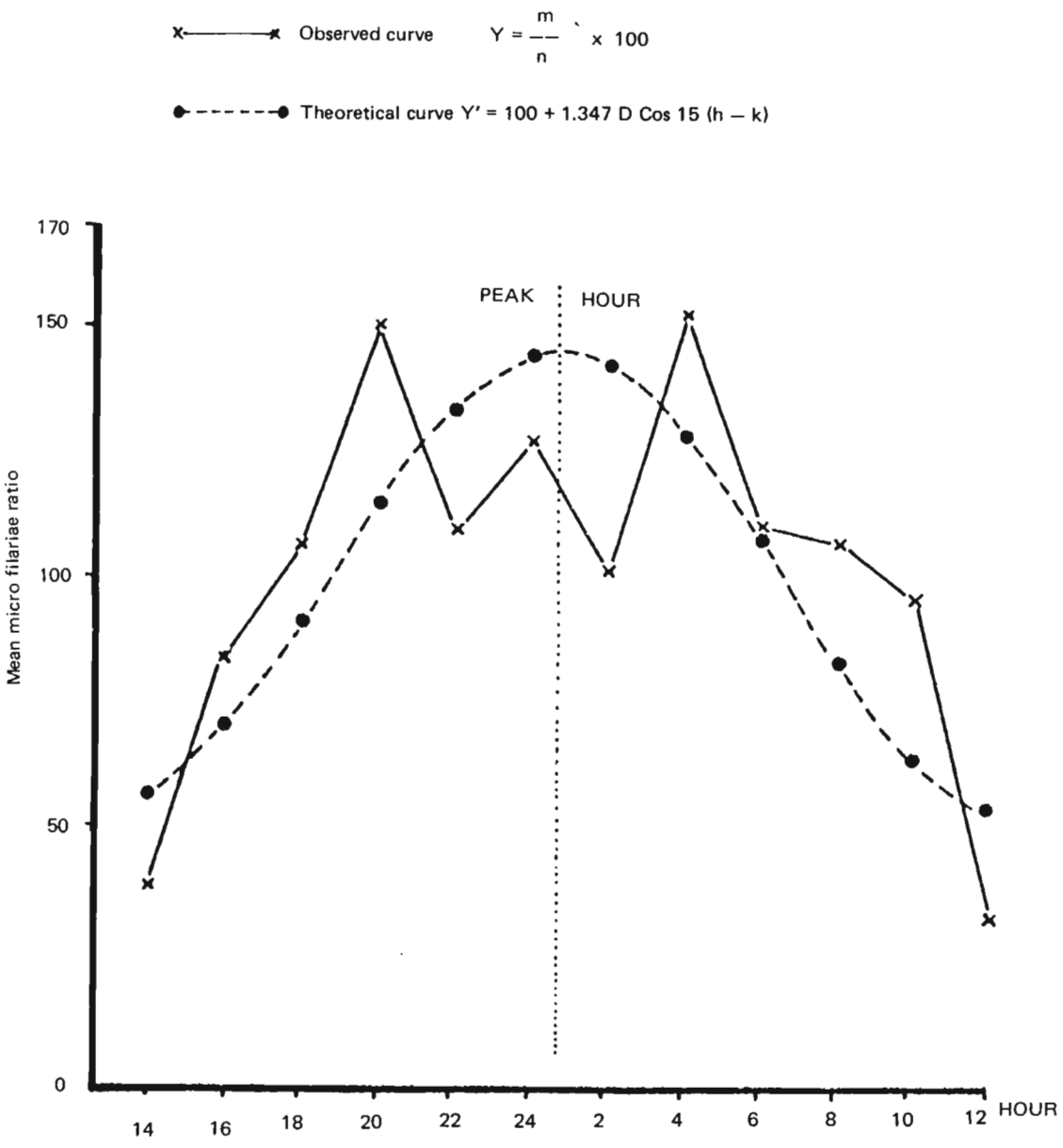

Fig. 2. Theoretical and observed periodicity curves of *Brugia malayi* microfilariaemic patents in Puding village, Jambi Province, Northeast Sumatera.

Among the potential filariasis vectors, there was a higher density of *Mansonia* than of *Anopheles* mosquitoes, which is probably reflected by the availability of suittable habitats in the village. The *Brugia* larvae found in infected mosquitoes needs to be confirmed through experimentation; however the higher rate of infection of *Mansonia* spp. than of *Anopheles* confirmed, suggests that *Mansonia* mosquitoes are the principal vectors in the village. The higher infection rate of *Mansonia* spp. from outdoor than from indoor collection, suggests that the transmission of the disease is probably reflected by the social behaviour of the villagers in the village.

Although the microfilariae finding in domestic cats needs confirmation, the fact, that 36 % of the cat population in the village was found infected, suggests that this animal could be a potential reservoir host. We plan to continue the work to include collection of more detailed clinical data, determination of annual bitting rate and annual transmission potential of each vector, host preference of the vector, identification of the species of *Brugia* found in cats and survey of monkeys.

SUMMARY

Preliminary study of malayan filariasis carried out in Puding village, Jambi Province, Sumatera revealed that the human filariasis among the villages was the nocturnally subperiodic from of *Brugia malayi*. The density of *Mansonia* spp was found to be higher than that of *Anopheles* spp. The mean number of all stages of *Brugia* larvae and of infective stage larvae were found higher in *Ma.uniformis, Ma. indiana* and *Ma. bonneae* than in *Ma. dives* or *An. nigerrimus*. Thus, the mosquito vectors in this village are likely to be *Mansonia* spp.

The domestic cats examined revealed 33.3 % of 15 cats had microfilariae infection with *Brugia* sp., which is still to be confirmed as *B. malayi*.

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